REMARKS/ARGUMENTS

The claims are 1, 2 and 4-5. Claim 1 has been amended to improve its form and to incorporate the subject matter of claim 3. Accordingly, claim 3 has been canceled. Claims 2 and 4 have also been amended to improve their form. Reconsideration is expressly requested.

Claim 1 was rejected under 35 U.S.C. 112, second paragraph, as lacking sufficient antecedent basis for the limitation "the mantle side" in line 14 of claim 1. In response, Applicant has amended claim 1, *inter alia*, to improve its form. It is respectfully submitted that all currently pending claims fully comply with 35 U.S.C. 112, second paragraph, and Applicant respectfully requests that the rejection on that basis be withdrawn.

Claims 1-3 were rejected under 35 U.S.C. 103(a) as being unpatentable over *Keller et al. U.S. Patent Application Publication No. 2002/0134706* in view of *Autenrieth et al. U.S. Patent No. 5,935,277*. The remaining claims 4-5 were rejected under 35 U.S.C. 103(a) as being unpatentable over *Keller et al.*

and *Autenrieth et al.*, and further in view of *Vora et al. U.S. Patent No. 6,280,609* and *Apffel U.S. Patent No. 4,597,788*. Essentially, the Examiner's position was that *Keller et al.* discloses the fission reactor recited in the claims, except for a fill opening for introducing the catalyst bed, which was said to be shown by *Autenrieth et al.* *Vora et al.* was cited with respect to claims 4 and 5 as teaching the use of a portion of an effluent stream to preheat a stream to a desired temperature prior to entering a reactor in order to eliminate the need for a charge heater and subsequently reducing the capital cost of the reaction system. *Apffel* was also cited with respect to claims 4 and 5, as teaching a temperature control valve that opens and closes a valve body which regulates flow of a temperature controlling stream in order to selectively control the temperature of a process stream.

This rejection is respectfully traversed.

As set forth in claim 1 as amended, Applicant's invention provides a fission or splitting reactor for a Claus plant, having

a boiler lined with refractory material, which has a combustion chamber having an inflow opening for a mixture of heating gas, air and acid gas containing H_2S, a catalyst chamber having a catalyst bed, and an outflow-side chamber having a gas outlet for hot process gas containing elemental sulfur. The boiler is configured as a horizontal cylindrical boiler, in which the combustion chamber, the catalyst chamber, and the outflow-side chamber are disposed next to one another. The catalyst chamber is delimited, on both sides, in the flow direction, by checker bricks that are gas-permeable and contain elongated holes. The catalyst chamber also has a mantle-side fill opening for introducing the catalyst bed. In this way, Applicant's invention provides a fission or splitting reactor, for a Claus plant which reduces the system technology, effort, and expense and ensures a functionally reliably operation.

None of the cited references discloses or suggests a fission or cracking reactor for a Claus plant, in which the boiler is configured as a horizontal cylindrical boiler, the catalyst chamber is delimited, on both sides, in the flow direction, by

gas-permeable checker bricks containing elongated holes, and a mantle-side fill opening is provided for introduction of the catalyst bed.

The primary reference to *Keller et al.* describes a splitting reactor for a Claus system, in other words, a system for the recovery of sulfur. See paragraph [0006]. This reactor is equipped with a boiler 40 lined with refractory material, which has a refractory lining 53. See paragraph [0043]. More specifically, there is a combustion chamber 49 having an inflow opening 44, by way of which heating gas, air, and H_2S are supplied. In addition, a catalyst chamber 47 is implemented, which is delimited by two barriers 46. See paragraph [0043]. With regard to these barriers 46, *Keller et al.* states that they are structured from a porous ceramic or refractory material.

With regard to the catalyst 47, paragraph [0045] of *Keller et al.*, marginally describes the possibility of being able to work with a catalyst bed ("bed of particulates"). In addition, in the example of FIG. 2 of *Keller et al.*, an outflow-side

chamber having an outlet 56 is indicated; however, *Keller et al.* is entirely silent as to the shape of the boiler 40.

In contrast to the *Keller et al.* system, Applicant's invention as recited in claim 1, as amended, contains at least the following aspects that are nowhere disclosed or suggested by *Keller et al.*:

a) the boiler (9) is configured as a horizontal, *cylindrical* boiler;

b) the catalyst chamber (10) is delimited on both sides by **checker bricks (14)** that are gas-permeable and **contain oblong or elongated holes**;

c) a **mantle-side filling opening (15)** is provided for introduction of the catalyst bed (3).

The defects and deficiencies of the primary reference to

Keller et al. are nowhere remedied by the secondary reference to *Autenrieth et al.*, *Vora et al.*, and *Apffel*. *Autenrieth et al.* relates to a reactor that is essentially concerned with obtaining hydrogen as an energy carrier for fuel cells. See column 1, lines 15-20 of *Autenrieth et al.* It is respectfully submitted that such a reactor has **nothing** to do with a splitting or fission reactor of a Claus system, if only because completely different temperature ranges are covered.

To the extent that the possibility of being able to remove individual catalyst pellets 2 is mentioned in *Autenrieth et al.*, in column 7, it should be noted that the opening 24 described at this point is provided for *outlet* of the pellets 2 in question. The *inlet opening 15* is shown in FIG. 2, which *Autenrieth et al.* describes simply at column 5, line 66 to column 6, line 6 as follows:

> "The charging device used in the reactor of FIG. 2 permits a largely pressureless lateral charging or replenishing catalyst pellet material into the reaction

space 1. For this purpose, the charging device, on the one hand, contains a laterally arranged charging tube 14 which is inserted into a passage opening 15 formed in the corresponding lateral reactor housing wall 8 *b* at the level of the upper area 1*b* of the reaction space 1."

Even if *Autenrieth et al.* can be said to allow one skilled in the art to recognize a filling opening for a catalyst bed according to aspect c) of Applicant's claim 1 as amended identified above on the mantle-side of the reactor, *Autenrieth et al.* still has this opening on a reactor having a completely different design and, in particular, for use in the low-temperature range. Moreover, with regard to the other aspects a) and b) of Applicant's claim 1 as amended, identified above, *Autenrieth et al.* is entirely silent.

The remaining references to *Vora et al.* and *Apffel*, cited with respect to claims 4 and 5, have been considered but are believed to be no more pertinent. None of these references discloses or suggests a fission reactor for a Claus plant, in

which the boiler is configured as a horizontal cylindrical boiler the catalyst chamber is delimited on both sides by gas-permeable checker bricks containing elongated holes, and a mantle-side filling opening is provided for introduction of a catalyst bed.

Thus, even if one were to make the hypothetical combination suggested by the Examiner, one would still not achieve Applicant's invention as recited in claim 1 as amended. Although *Keller et al.* discloses a splitting reactor having significant agreement with certain aspects of Applicant's claim 1 as amended, it is respectfully submitted that the configuration of the catalyst as well as the catalyst chamber of *Keller et al.* is completely different from Applicant's fission reactor as recited in claim 1 as amended. In fact, *Keller et al.* prefer catalysts that are configured as a wire braid or at least as a ceramic monolith. See paragraph [0045]. The possibility of alternatively being able to work with a catalyst bed is mentioned at most only marginally.

Thus, it is respectfully submitted that in *Keller et al.* the

problems of perfect positioning, filling, and a reliable method of functioning of such a catalyst bed have not even been considered as a possibility, in the case of a splitting reactor for a Claus system because the requirements described can be fulfilled only if first of all, a mantle-side filling opening (15) for introduction of the catalyst bed (3) is provided, as indicated by aspect c) identified above Applicant's claim 1 as amended. Only by means of this mantle-side filling opening is it even possible to equip the catalyst chamber, which is delimited on both sides, with the catalyst bed, or to perform an exchange if necessary.

In order for this catalyst bed to also fulfill its original function of catalytic conversion of the hydrogen sulfide, and, at the same time, to be protected from overheating or an open flame in the preceding combustion chamber (2), porous delimitation walls of the catalyst chamber are provided in Applicant's fission reactor as recited in claim 1 as amended. Significantly, these delimitation walls are **not** the usual porous bricks or refractory bricks, but rather are checker bricks (14) that are gas-permeable

and contain elongated holes as is expressed in characteristic b) of Applicant's claim 1 as amended identified above. This feature is an important and by no means trivial difference because porous bricks without any more detailed specification are simply and decisively "plugged up" when a catalyst bed is introduced.

Such plugging up from the catalyst bed consisting, in most cases, of catalyst pellets in spherical shape, which lie against the edge of the bricks in question and can plug the pores up, in whole or in part, which significantly restricts the functioning of the catalyst if not actually completely prevents such functioning. Furthermore, there is the risk that the hot mixture of the heating gas, the air, and the H_2S can no longer flow through the catalyst chamber configured in this manner without hindrance, or cannot flow through at all, so that dangerous overheating phenomena are or can be the consequence.

Applicant's invention as recited in amended claim 1 counters these problems by delimiting the catalyst on both sides of the chamber by gas-permeable checker bricks, not simply porous

bricks. In other words, Applicant's fission reactor uses bricks that form a grid in cross-section. In addition, the checker bricks are equipped with elongated holes, which are not plugged up by the spherical pellets of the catalyst bed, i.e. no such danger exists. In other words, only the catalyst bed according to Applicant's claim 1 as amended can reliably fulfill its function, because the hot gas mixture to be processed can flow through the bed without any problems. In addition, the checker bricks assure reliable separation of the catalyst chamber from the other process chambers, and thus damage to the catalyst is prevented in any case.

All of these advantages are further reinforced by configuring the boiler as a horizontal cylindrical boiler according to aspect a) of claim 1 as amended identified above. The cylindrical shape of the boiler supports a uniform flow of the process gas in the interior, whereby almost laminar flow conditions are observed, in connection with the checker bricks having oblong or elongated holes, at least in this region. As a result, the effectiveness of the catalyst is further increased.

Thus, it is respectfully submitted that none of the prior art, whether alone or in combination, discloses or suggests a fission reactor as recited in claim 1 as amended having all of the characteristics recited therein, or teaches the benefits that accrue from that combination. Accordingly, it is respectfully submitted that claim 1 as amended together with claims 2 and 4-5, which depend directly or indirectly thereon, contain patentable and unobvious subject matter.

In summary, claims 1, 2 and 4 have been amended, and claim 3 has been canceled. In view of the foregoing, it is respectfully requested that the claims be allowed and that this application be passed to issue.

Respectfully submitted,
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PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: THIELERT - 3 PCT

SERIAL NO.: 10/520,853 EXAMINER: MATTHEW J. MERKLING

FILED: JANUARY 10, 2005 GROUP: 1764

TITLE: FISSION REACTOR FOR A CLAUS PLANT

PETITION UNDER RULE 136(a) AND RULE 17(a)(1)

MAIL STOP: AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

S I R :

Applicant petitions the Commissioner of Patents and Trademarks to extend the time for response to the Office Action dated July 24, 2007 for one month from October 24, 2007 to November 24, 2007 (Saturday). A check in the amount of $120.00, covering the fee for a one-month extension for a Large Entity is enclosed herewith. Any deficiency or overpayment should be charged or credited to deposit Account No. 03-2468.

Respectfully submitted,
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